

**APPARATUS AND METHOD FOR  
GENERATING PRESSURE CHANGES IN A  
MAMMALIAN ORAL/THROAT CAVITY**

**FIELD OF THE INVENTION**

This invention relates generally to methodology and apparatus for establishing predetermined vacuum or pressure levels in the mouth and throat cavity of a mammalian body, such as that of a human, in coordination with the mammal's respiratory pattern.

**BACKGROUND OF THE INVENTION**

This invention is based on my discovery that respiration-regulated air pressure, either positive or negative (vacuum), in a person's mouth and throat cavity, produces beneficial effects to the person's health such as alleviation of throat discomfort and snoring. The hypothetical explanation of this finding is that respiration-regulated air pressure in a person's mouth and throat cavity stimulate the body's autonomic nervous system, circulatory system, and especially lymphatic system and therefore enhances certain physiological functions, such as lymphatic flow. The body's autonomic nervous system, circulatory system, and lymphatic system are all responsive to pressure changes in the respiration system while a person is inhaling and exhaling. For example, J. W. Shields has conducted a study on the effects of breathing on the lymphatic system. Using cameras inside the body, he found that deep, diaphragmatic breathing stimulated the cleansing of the lymph system by creating a vacuum effect which draws lymph through the bloodstream. See *Human Central Lymph Propulsion*, JAMA, Vol. 246, No. 18, Nov. 6, 1981, Shields, et al.

**SUMMARY OF THE INVENTION**

Accordingly, in one aspect of the invention, a method for inducing pressure changes in the mouth and throat cavity of a mammal includes the steps of monitoring a respiration pattern of the mammal to determine a first time period during which the mammal is inhaling and a second time period during which the mammal is exhaling. A partial vacuum is induced in the mammal's mouth and throat cavity during the first time period and the partial vacuum is removed during the second time period.

In another aspect of the invention apparatus for inducing pressure changes in the mouth and throat cavity of a mammal includes a regulated vacuum source having an outlet and a control input, an appliance in fluid communication with the outlet of the vacuum source, the appliance adapted for placement in a mouth of a mammal so as to be in fluid communication therewith. A sensor, adapted to be coupled at a preselected portion of the mammal's anatomy and operative to generate a first signal whenever the mammal inhales and a second signal whenever the mammal exhales, signals a controller having an output coupled for controlling the output of the vacuum source. The controller has at least one input coupled for receipt of the first and second signals from the sensor. The controller is operative upon receipt of the first signal to cause the vacuum source to pull at least a partial vacuum in the appliance. The controller is operative upon receipt of the second signal to cause removal of the partial vacuum from the appliance.

**BRIEF DESCRIPTION OF THE DRAWINGS**

The objects and features of the invention will become apparent from a reading of a detailed description taken in conjunction with the drawings, in which:

FIG. 1 is a functional block diagram of a first embodiment of a system arranged in accordance with the principles of the invention;

FIG. 2 is a functional schematic of sensor element suitable for use in the system of FIG. 1;

FIGS. 3A and 3B are side and top cross sectional views of an oral appliance arranged in accordance with the principles of the invention;

FIG. 4 is a timing diagram showing the output of sensor 144 of FIG. 1 in relation to a typical respiratory pattern; and

FIG. 5 is a functional block diagram of an alternative embodiment of the invention.

**DETAILED DESCRIPTION**

FIG. 1 sets forth a functional diagram of apparatus arranged in accordance with the invention. System 100 includes a vacuum source or pump 110 having an outlet 112 coupled to a first end of a conduit 182. An opposite end of conduit 182 is coupled to an inlet of regulator 180. An output of regulator 180 is coupled via conduit 172 to a vacuum chamber 170. Chamber 170 is coupled via conduit 163 to a first port 162a of fluid flow valve or fluid switch 160. A second port 162b of switch 160 is vented to the atmosphere via conduit 161. Port 162c of switch 160 is coupled via a preferably flexible conduit 125 to an inlet port 122 of oral appliance or appliance element 120 which is sized and shaped for facile insertion into the mouth of an individual.

Appliance 120 is substantially disk shaped and has a hollow interior 132 in fluid communication with the conduit 125 via appliance inlet 122. Additionally a plurality of passages 126, 128 and 130 are arranged in a preselected pattern on at least one side of appliance 120 for providing fluid communication between interior 132 of appliance 120 and the mouth and throat cavity of the individual.

Sensor 140, for generating an indication of whether or not the individual is inhaling or exhaling, includes a belt 142 for engagingly surrounding the abdominal cavity of the user. Ends of the belt 142 terminate at a sensor element 144 which is operative to generate signals indicating inhaling and exhaling. The signals are coupled via bus 146 to an input 154 of a controller 150. Controller 150 may, for example, take the form of a stored program type controller such as a microprocessor-based element. Output 152 of controller 150 is coupled via bus 155 to a control input 181 of regulator 180. A second output 153 of controller 150 is coupled via bus 156 to a control input 164 of fluid switch 160.

In operation, system 100 generates desired pressure levels by having the individual utilizing the system insert the appliance 120 into the oral cavity and by strapping belt 142 about the individual's abdominal cavity. Upon inhaling in the midst of a normal breathing pattern, an appropriate signal is developed by sensor 144 and coupled to controller 150. Controller 150, via bus 155, enables regulator 180 to regulate the output 112 of vacuum source 110 at a preselected vacuum level. Upon receipt of the inhaling indication signal, controller 150 signals switch 160 via bus 156 to fluidly couple port 162a to port 162c thereby enabling at least a partial vacuum to be pulled at the interior 132 of appliance 120 via conduit 125. This partial vacuum is extended into the mouth and throat cavity via passages 126, 128 and 130. Upon cessation of the inhaling cycle and initiation of the exhaling cycle of the breathing pattern, an appropriate signal at sensor 144 is coupled to controller 150 which signals switch 160 via bus 156 to switch port 162c from its fluid connection to port 162a over to port 162b, thereby venting conduit 125 and appliance 120 to the